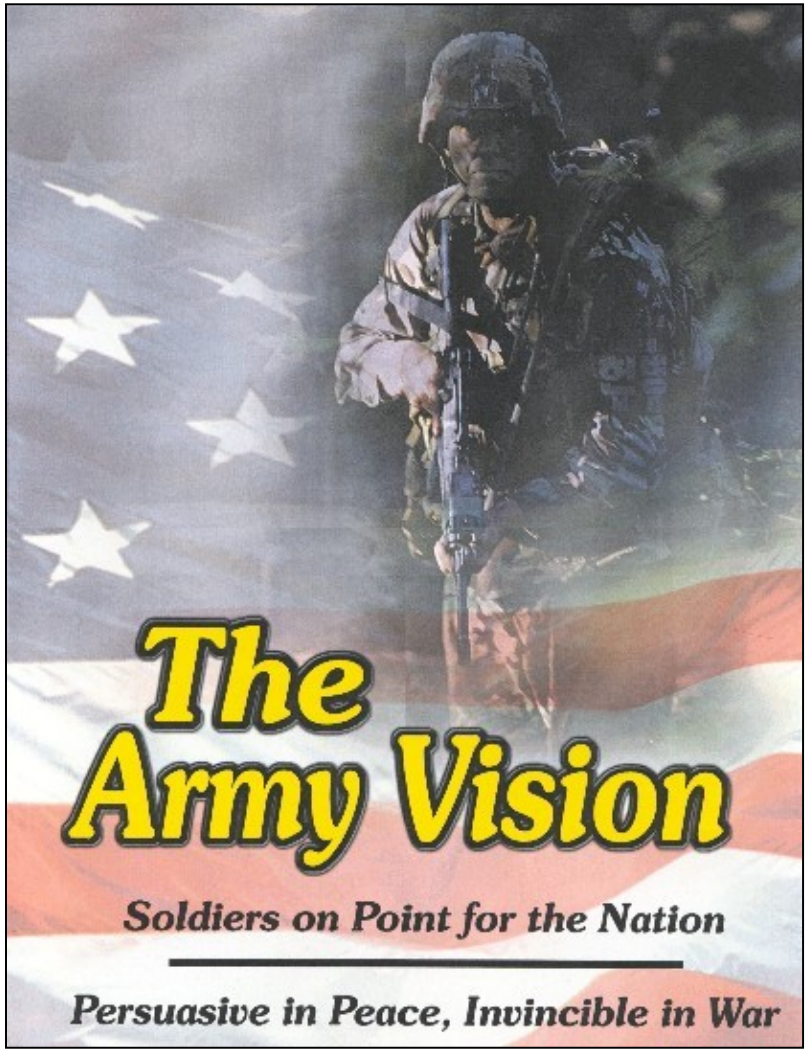
Army Science & Technology …Accelerating the Pace of Transformation

Armaments for Full Spectrum Warfare Conference & Exhibition

Parsippany, New Jersey

23-25 June 2003

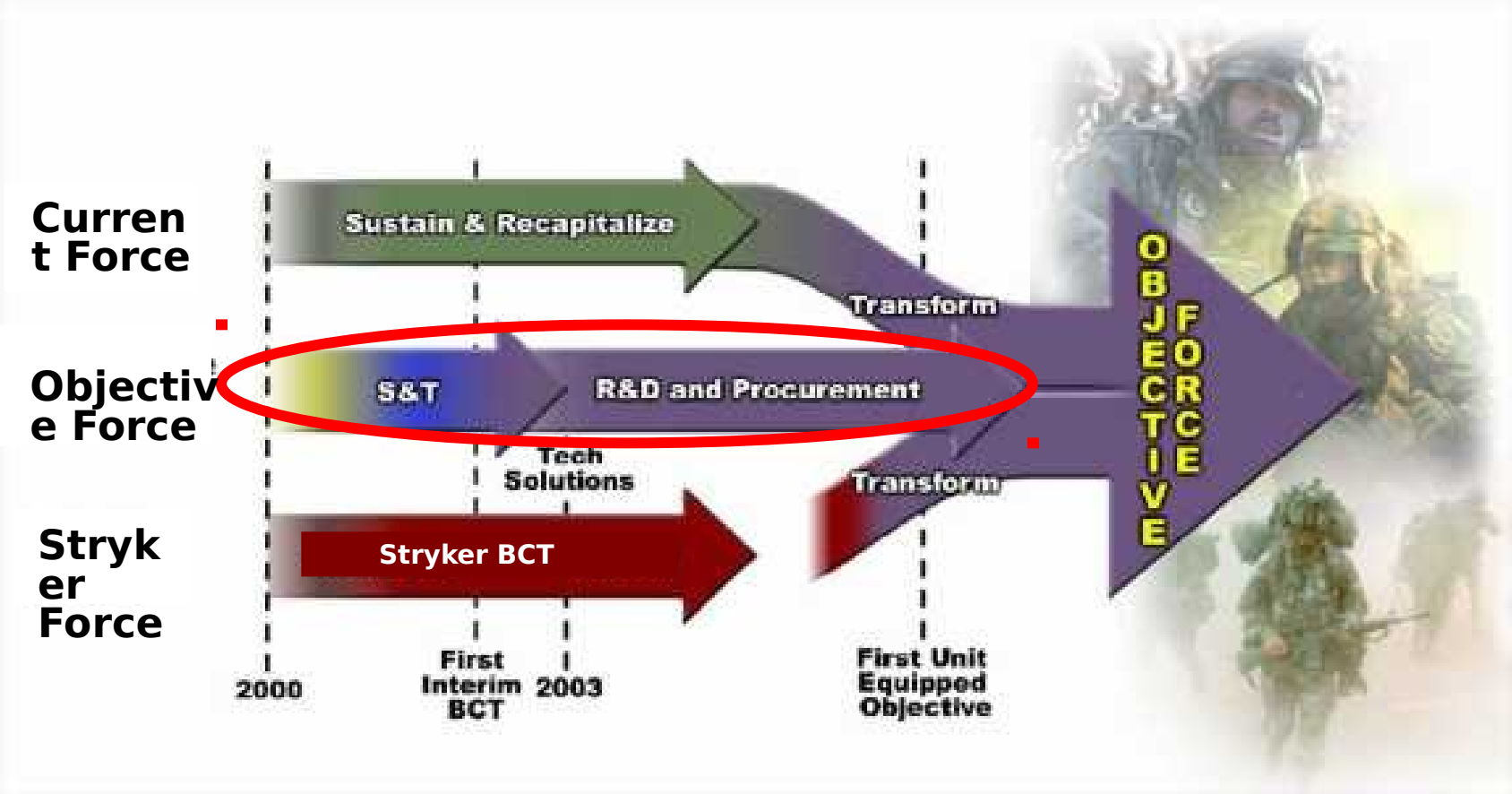


Dr. Marilyn M. Freeman
Deputy Director Armament, Vehicle & Soldier Technologies
Office of the Assistant Secretary of the Army
for Acquisition, Logistics and Technology

Purpose

- *To provide an overview of the U.S. Army S&T Transformation Strategy*
- *To provide an update of selective Future Combat System S&T thrusts with an emphasis on armament and armament related initiatives*

The Army Transformation



"The S&T community is the key to the long term transformation of the Army" - - CSA ***Oct 1999, HAS***

Objective Force for Full Spectrum of Missions

Environmental Complexity

High — **Urban**

Open rolling terrain — **Low**

Increased strategic responsiveness

- ✓ Brigade in 96 hrs; Division in 120 hrs; Five Divisions in 30 days
- ✓ Fight immediately upon arrival
- ✓ Simultaneous air and sea lift

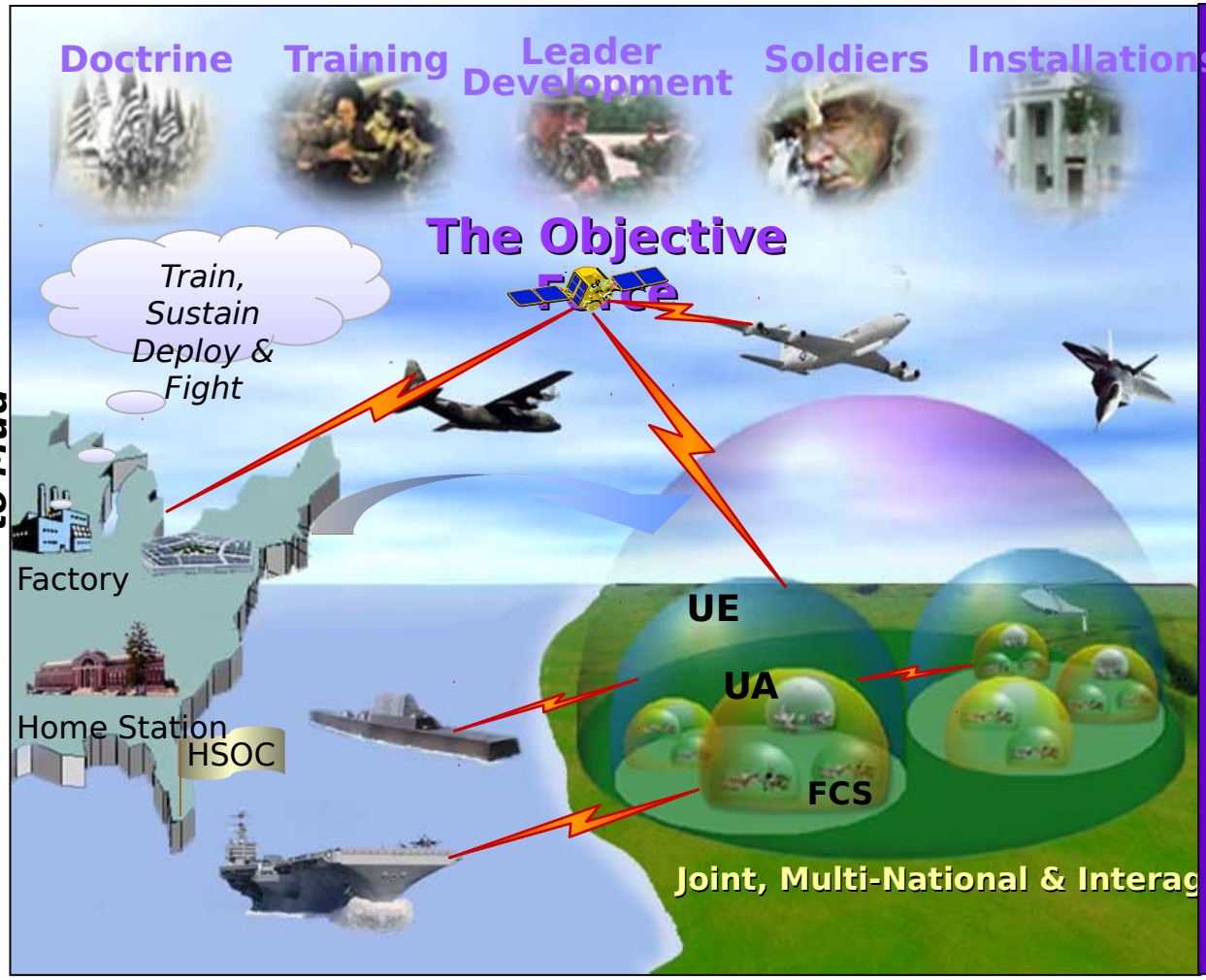
Stability and Support — **Small Scale Contingencies** — **Major Theater War**

Spectrum of Conflict

Capabilities for an Uncertain Future

Concept of the Objective Force

Objective Force *"Space to Mud"*



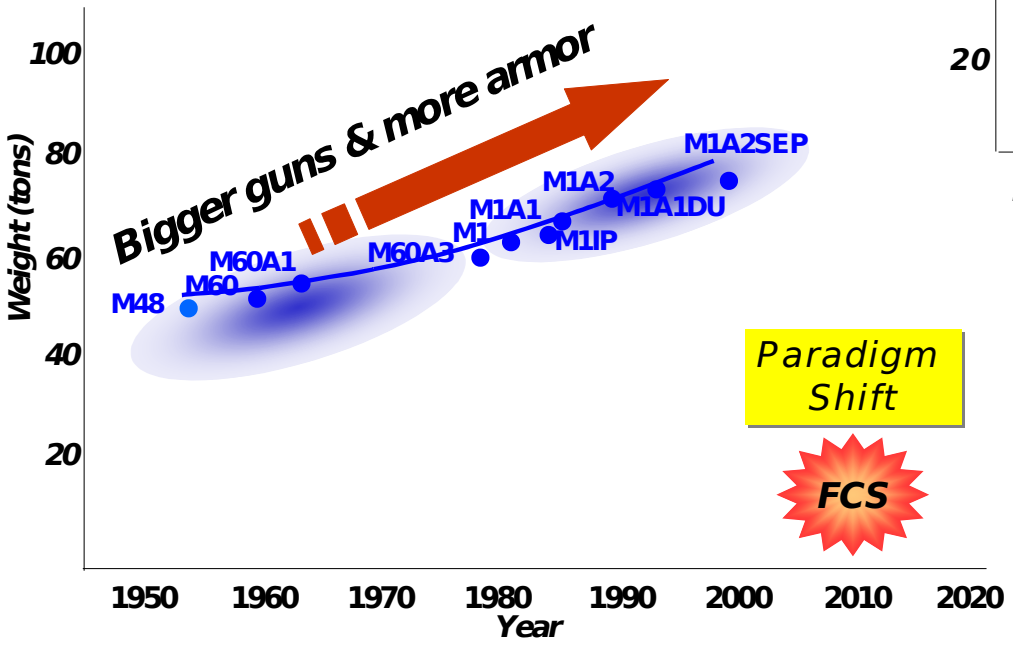
- **Full Spectrum Army** -campaign quality forces with special purpose capabilities
- **Joint & Combined Force -** by design
- **Enabled by Knowledge** -network centric, self-aware and adaptive soldiers and leaders, agility enhanced by advanced technology
- **Adaptive Organizations -**
  - Unit of Action (UA) (Bde) – conducts engagements; enabled by maneuver, maneuver support, and maneuver sustainment from the UE
  - Unit of Employment (UE_1) (Div TF) - conducts battles & precision attacks of key enemy capabilities

Objective Force *"Factory to Foxhole"*

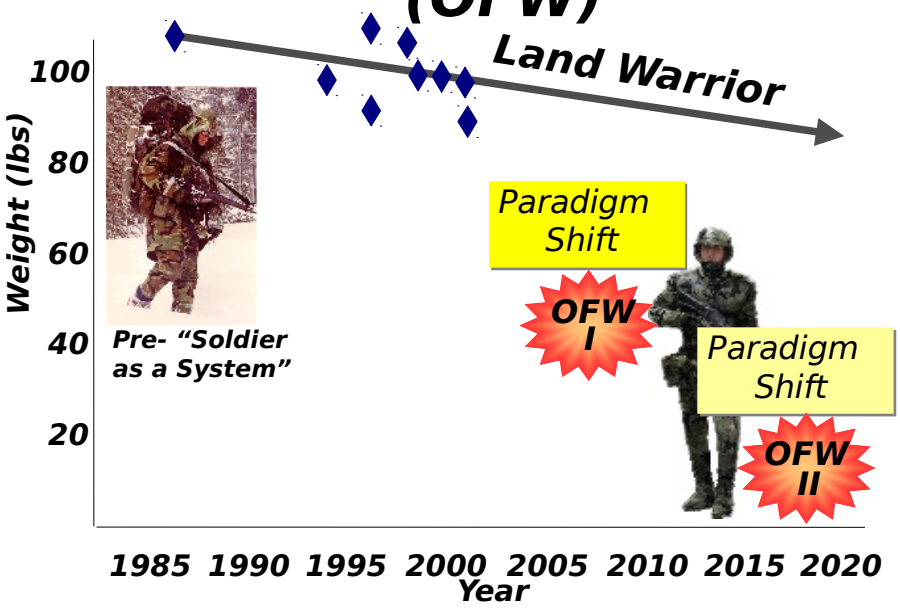
Objective Force Designs
A System of Systems Approach

Transformation Demands Paradigm Shift …

Future Combat Systems (FC



Objective Force Warrior (OFW)



…Providing Leap Ahead Capabilities Sooner

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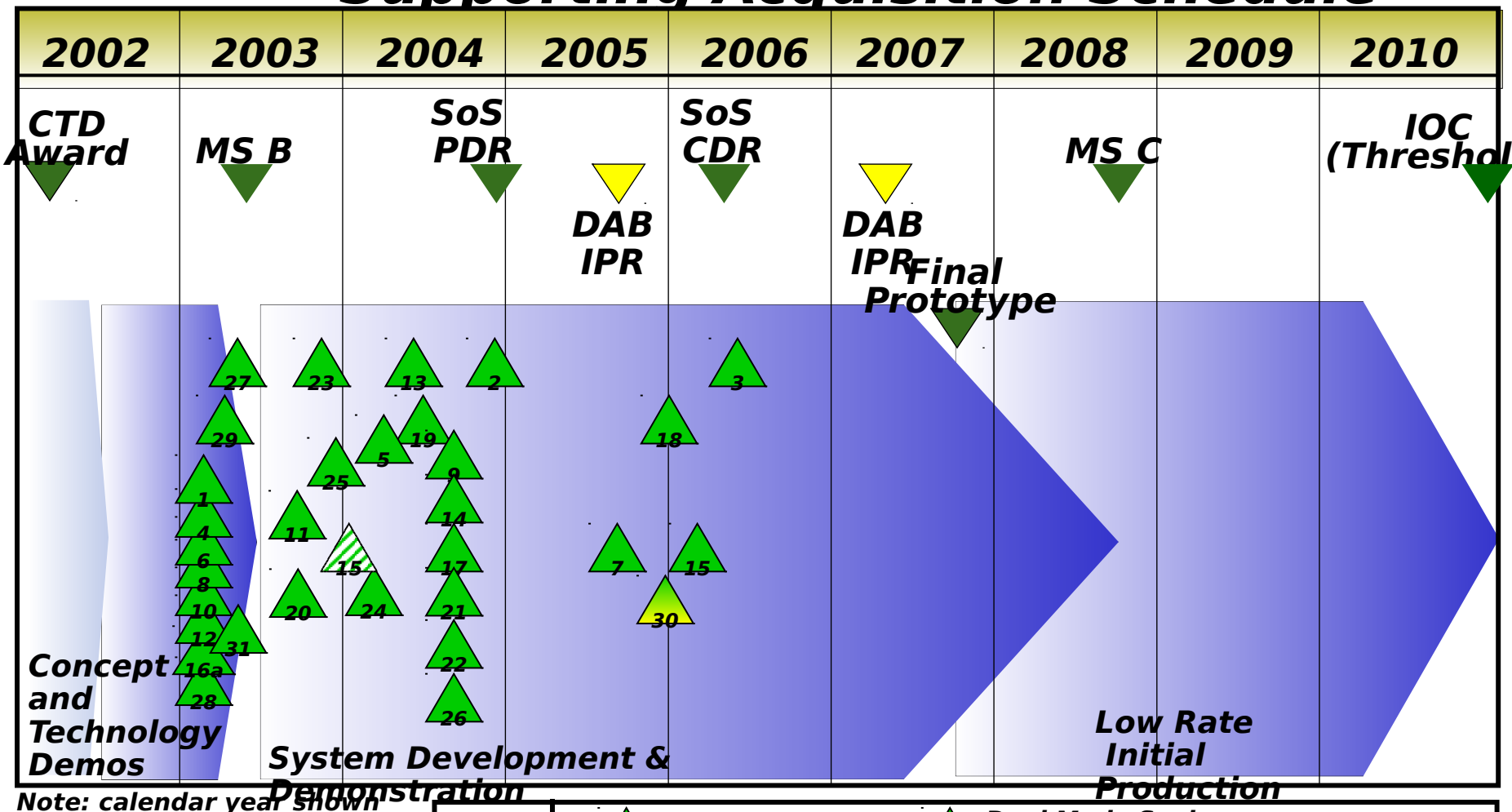
FCS Critical Technology Readiness

Supporting Acquisition Schedule



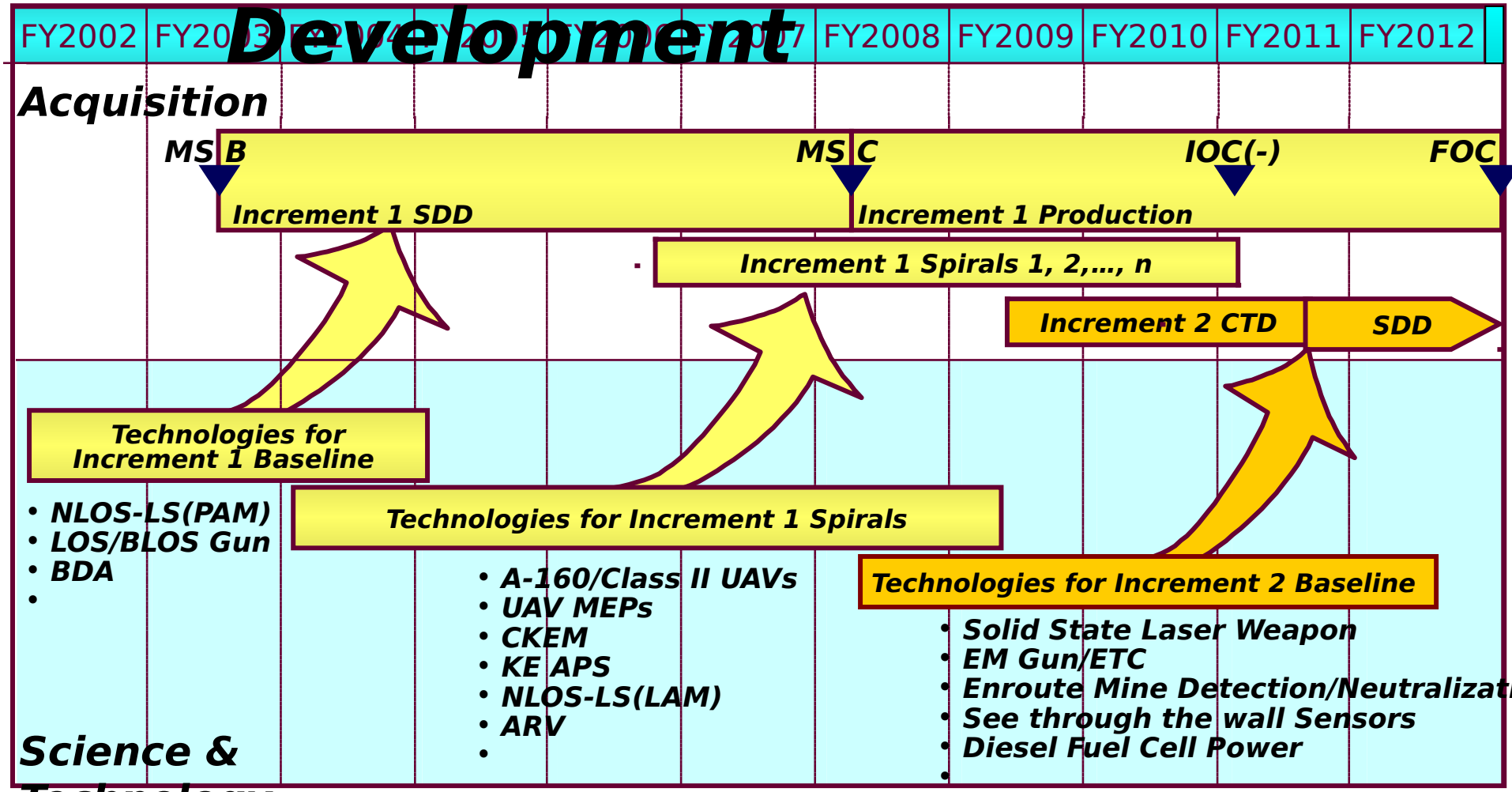
Note: calendar year shown

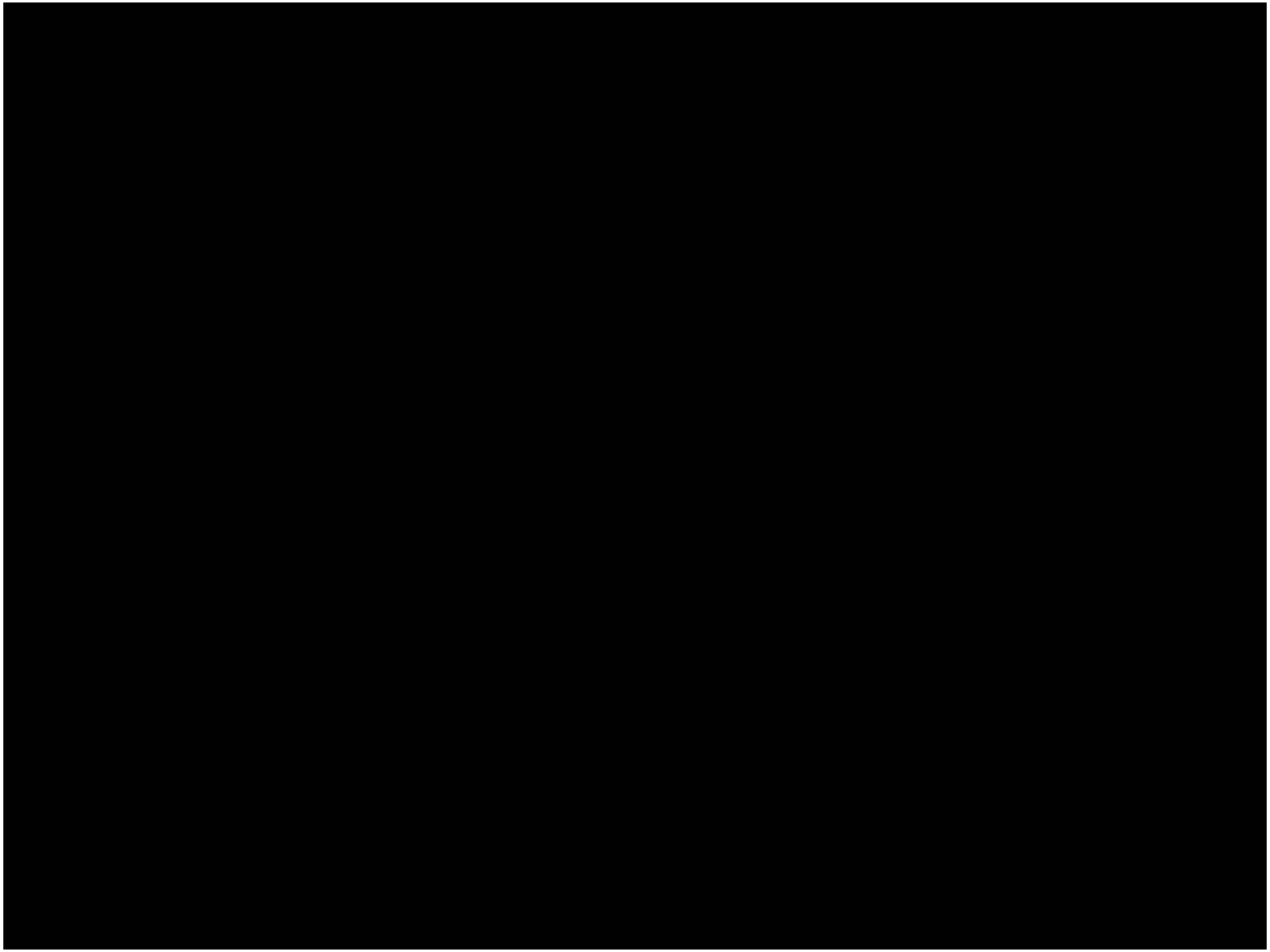
Critical Technology Number

CTs after PDR

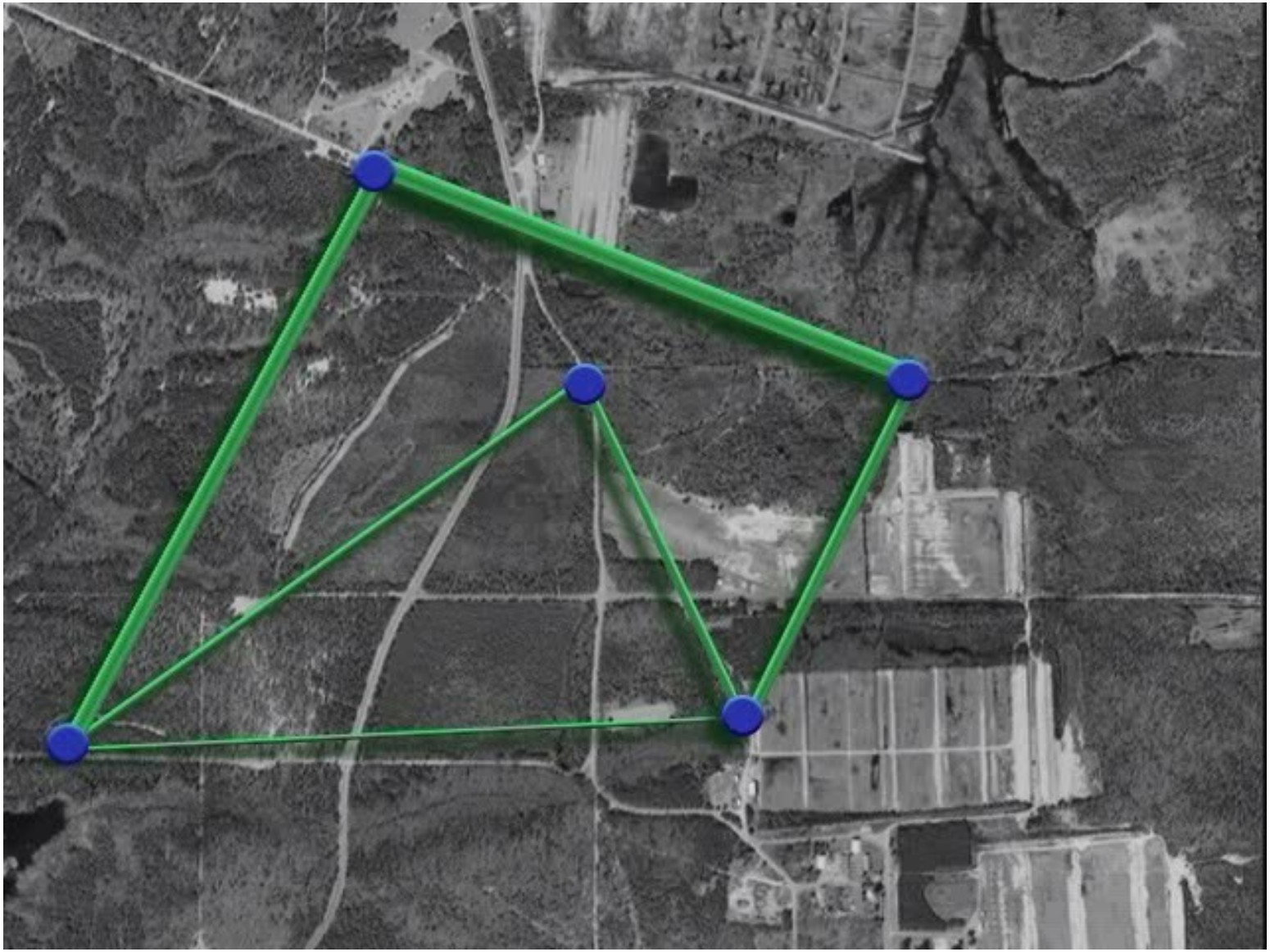
- 3 Network Security
- 7 Wideband Waveforms
- 15 Dual Mode Seeker Precision Munitions
- 18 Manned/Unmanned Collaborations
- 30 Countermine

S&T Strategy for FCS Spiral Development





Technologies To Build Future Combat Systems In This Decade



RL
RL

FCS Indirect Fire Vehicle

United Defense

S&T Strategy for this Decade

- *Next Generation of FCS*
- *Accelerate High Payoff Core Army Technologies*
  - *Move, Shoot, Communicate and Survive*
  - *AMC RDE Command -- System of Systems Technology Testbed*
- *Partner with DARPA for a few new initiatives*
  - *Find the enemy*
  - *Autonomy with intent (Robotics)*
  - *Affordable Combat ID*

Where we are with FCS Technologies Today

OAV

A-160 Hummingbird

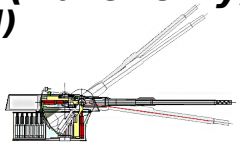
UAV RSTA / Comm Relay

Adv. Sensors

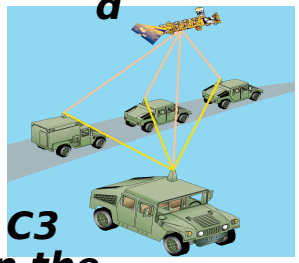
UGCV (150 Kg Payload)

UGCV (2,000 Kg Payload)

Follower UGVs (Autonomy)



120mm LOS/BLOS ATD



C3 on the Move

See First

Understand First

Objective Force

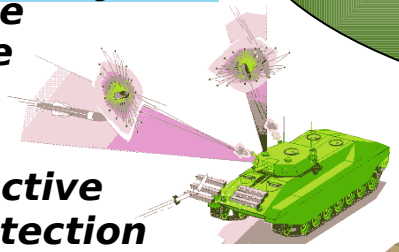
Finish Decisively

Act First

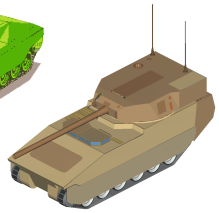
MRM

KE

OCSW

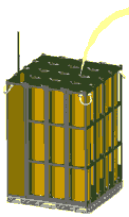


Active Protection



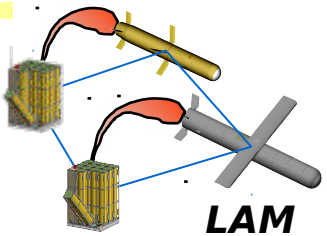
Advanced Mobility

Hybrid Electric Propulsion

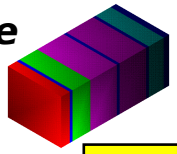


NLOS-LS

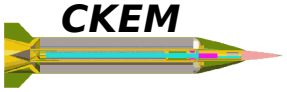
PAM



LAM



Integrated Armor



CKEM

Technologies to Build FCS in this Decade

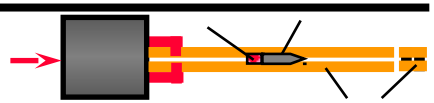
OCSW

Lethality
FY04-09 $1.7B

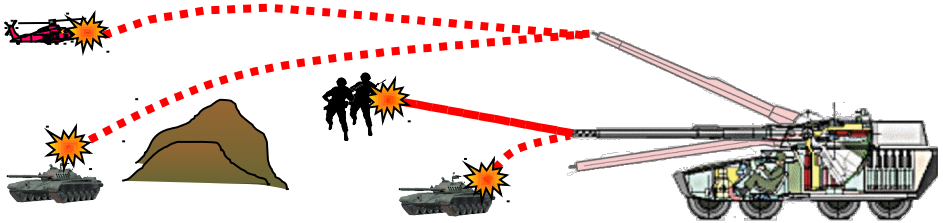
Guns and Munitions … Kill at longer ranges

Multi-mission Capability from a Single Platform

EM Gun Tech Demo



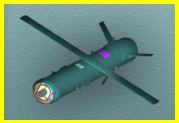
Validate Hypervelocity Lethality



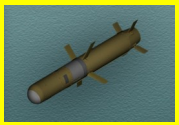
BLOS 2-12km **LOS 0-4km**

Missiles…Extended Range and Loiter with greater Lethality

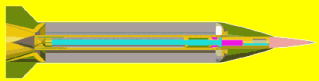
Next Gen NLOS-LS and C3



Loitering Attack Missile (30-60 min)



Precision Attack Missile (>40km)



Compact Kinetic Energy Missile

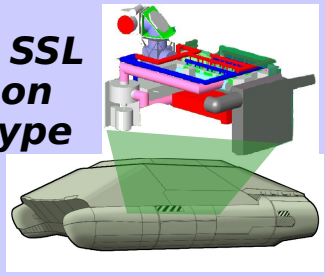
Maintain Lethality w/ Increased Stowed Kills

Directed Energy Tunable Lethality

Solid State Laser (SSL) Technology

Speed of Light Engagement

100kW SSL Weapon Prototype



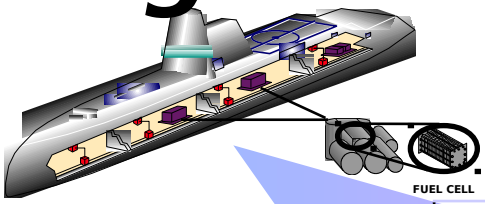
- *Precision Fires*
- *Overwhelming Lethality at Longer Ranges*
- *Reduced Logistics*

Power and Energy… … Pervasive and Enabling

POWER GENERATION
- Fuel Cells & Fuel Reforming
- Novel Power

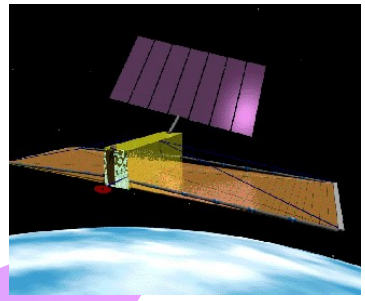
ENERGY STORAGE
- Batteries
- Capacitors

POWER CONTROL AND DISTRIBUTION
- Switching & Conditioning
- Power Transmission & Distribution
- Thermal Management

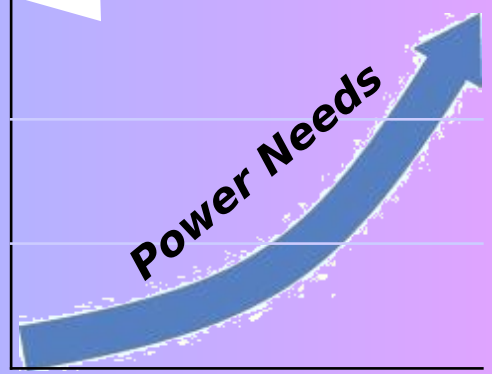


Electric Warship

More Electric Aircraft

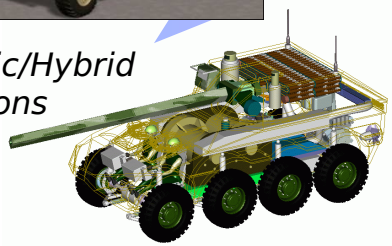

Space Based Radar

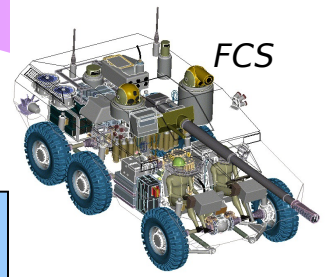
Warrior



High Power Microwave

Electric/Hybrid Weapons




FCS

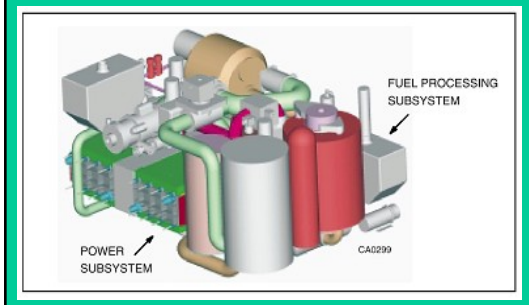
New Operational Capabilities

Power and Energy Technologies

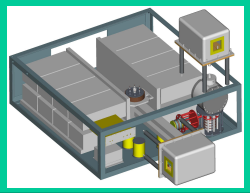
FCS Vehicle Power

- All Electric vehicles
- Fuel efficiency
- Silent mobility

Hybrid Electric Drive



Diesel Reformer Power



Pulse Power for...
Electric Weapons & Protection

6x Power Density

- Minimize deployment time
- Self Sustainment
  - 3 days - High optempo
  - 7 days - Low optempo
- New capabilities
  - Lethality
  - Survivability

09 $0.6B

Soldier System Power

- Reduce weight
- Increased power
- Increased mission time

Microturbine/ Microengines

10x Power Density

Electric Power- A key enabler of US Army Objective Force Transformation

- **Sustainment - Improved fuel economy – 20-50% depending on hybrid configuration and mission (reduced logistics)**
- **Mobility -Improved stability resulting from HEV design flexibility**
  - **Typically lower vertical center of gravity**
  - **More advantageous weight distribution**
- **Agility -Improved acceleration and slope performance (instantaneous torque)**
- **Silent Watch and Silent Mobility (improved energy storage- e.g. high energy batteries)**
- **Advanced survivability and lethality opportunities**
  - **Electric Armor**
  - **EM Gun**
  - **Directed Energy Weapons**

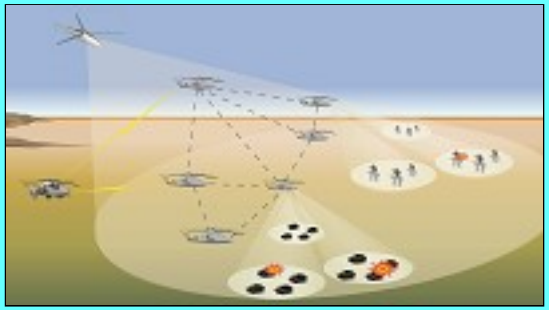
Unmanned Systems

Paradigm Shifts in Warfighting Capability

FY04-09 $0.9B

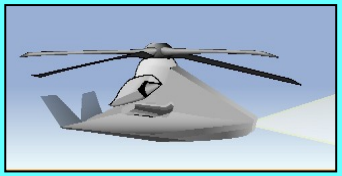
Acting First…Extending the

Autonomous Teaming



Unmanned Ground Vehicles

Unmanned Combat Armed Rotorcraft



1,000 lbs and 8 hrs

Armed Reconnaissance Vehicles

Autonomous Combat Operations with Unmanned Systems

Assured comms and situational awareness

A-160 Hummingbird

1,000 lbs and 40 hrs

Organic Air Vehicle (OAV)

~10 lbs and 1 hr

Micro Air Vehicle (MAV)

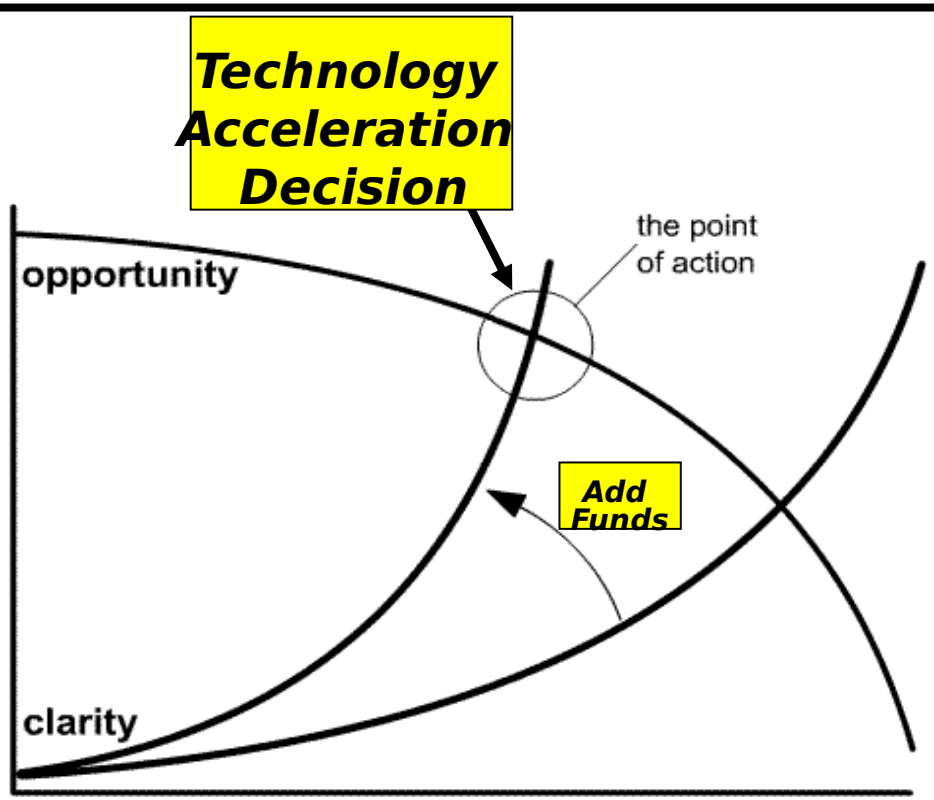
<1 lb and 30 mins

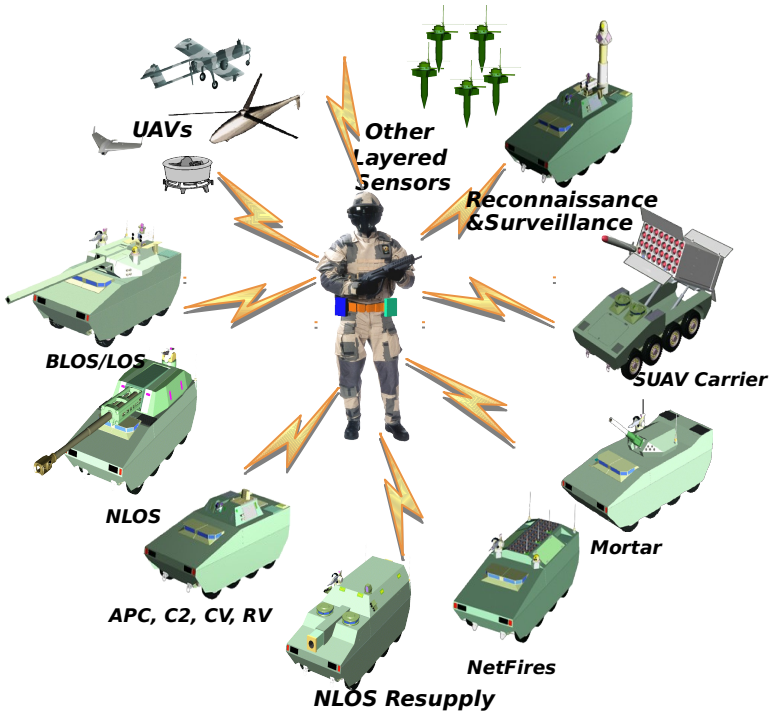
Unmanned Systems Technical Challenges

- ***Perception – software driven***
  - ***Obstacle classification/avoidance***
  - ***Understanding (e.g. rain+soil=mud)***
  - ***Decision processes***
- ***Platforms and characteristics***
  - ***UGV's – mobility, agility***
  - ***UAVs –payload, range, operating conditions, recovery***
- ***Situational Behavior***
  - ***Independent***
  - ***Cooperative***
- ***Soldier Interface***
  - ***Operating techniques/limitations***
  - ***How much/frequent, under what conditions human intervention?***

As technology matures it will be applicable to a greater variety of combat roles and will enable greater confidence in postulating the conditions under which unmanned platforms should be used.

Where we are going…

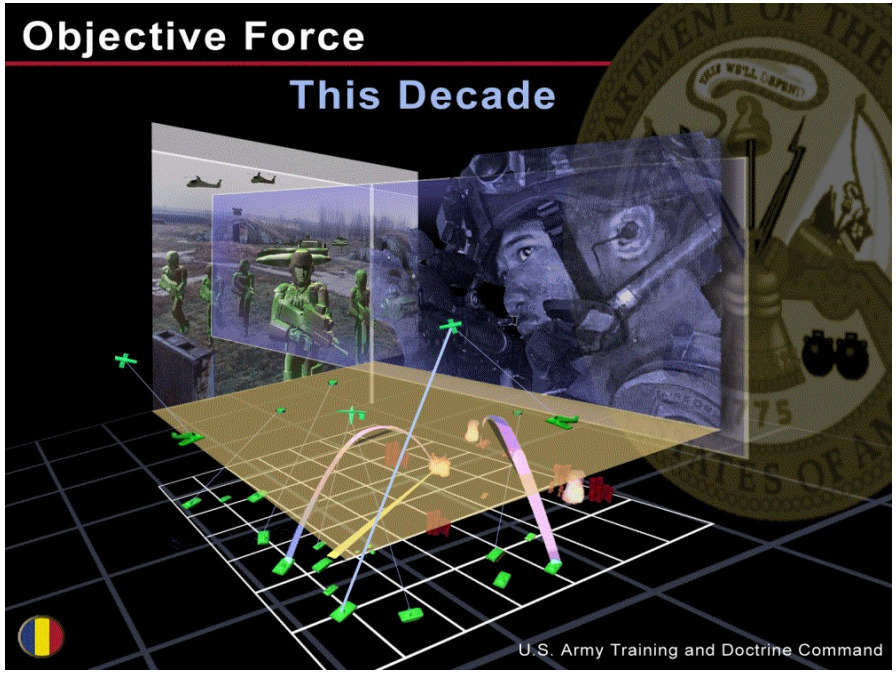




Fourth Generation R&D, Miller and Morris, 1999

Now is time to take the first step – FCS is the opportunity

The Army…
On the Fast Track to Transformation



Finishing Decisively

"Our defense review identified six goals that drive our transformation effort:
…Second, we must be able to project and sustain forces

…programs to project and sustain forces in distant theaters—such as…the Future Combat Systems."

Secretary Rumsfeld
February 5 & 6, 2003
House / Senate Armed Services Committees